Gordon van Welie
President and Chief Executive Officer

April 18, 2014

U.S. House Committee on Energy & Commerce
2125 Rayburn House Office Building
Washington, DC 20515

Dear Chairmen Upton, Whitfield, and Barton, and Vice Chairmen Blackburn and Scalise:

Thank you for your March 26 letter regarding the operation of New England's bulk electric system during the recent winter. I have addressed each question below (in several cases combining questions to provide a more comprehensive answer).

Since 2010, we have been intently focused on many of these issues you raise as part of ISO New England's broader Strategic Planning Initiative, including managing the ever-growing interdependencies between the natural gas and electric industries, declining resource performance, and the near-term retirement of oil- and coal-fired and nuclear power plants in our region.

I testified about these issues before the Energy & Power Subcommittee on March 19, 2013[1] (and before the Senate Energy & Natural Resources Committee on May 14, 2013[2]). Since that time, ISO New England and the region have taken a number of steps to strengthen short-term reliability on the bulk electric system and facilitate long-term changes, which I note in my answers below. However, our region continues to be hampered by significant constraints on the natural gas pipeline system – a challenge that will be exacerbated as older, non-gas generation leaves the system in the coming months and years.

Operations during the winter 2012/2013 were seriously challenged by the inability of some natural gas-fired generators to obtain fuel during critical periods, issues that were made more acute by the lack of on-hand oil inventory -- leading to several close calls during a late January 2013 cold snap and an early February 2013 snow event. These adverse operational experiences caused ISO New England to take action to mitigate the reliability risks posed by gas pipeline constraints and ensure that additional on-site fuel would be available for the winter of 2013/14.

In October 2013, the Federal Energy Regulatory Commission (FERC) gave final approval to the ISO New England-designed 2013/2014 Winter Reliability Program (which ran from December 1-February 28).[3] The Program involved the procurement of oil inventory services (equivalent to approximately two million megawatt hours of oil-fired energy), along with a smaller demand response component, to

[1] http://www.iso-ne.com/pubs/pubcomm/pres_spchs/2013/gvw_testimony_hec_ep_gas_elec_hrg.pdf
[2] http://www.iso-ne.com/pubs/pubcomm/pres_spchs/2013/gvw_testimony_senrc_ngforum.pdf
[3] Appropriate FERC filings regarding ISO New England's 2013/2014 Winter Reliability Program can be found at: http://www.iso-ne.com/key_projects/win_relblty_sol/iso_ne_filings/

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hedge against reliability concerns raised by the lack of secure natural gas arrangements and previously low levels of oil inventory for power generation in New England. As I note below, the region's oil inventory was critical to maintaining power system reliability during the recent winter and we will continue to rely heavily on oil and other forms of non-pipeline gas-fired electrical energy.

The region also implemented several rule changes leading into this winter, including moving up the timing of the region's Day-Ahead Market to better coordinate with the natural gas day, increased reserve requirements (discussed below), and tightened incentives to improve generator performance. We also continued to increase our communications with the gas pipeline operators (assisted by FERC Order 787), and have expanded our operations team to include a position in ISO New England's control room dedicated to coordinating gas-electric system operations. Looking forward, we are in the midst of implementing a significant change to our energy market that will allow the region's generators to greatly improve their ability to manage fuel price volatility and we also have filed a proposal at the FERC to significantly strengthen the performance incentives in our capacity market.

I am also including ISO New England's presentation[4] at FERC's April 1 technical conference on 2014 winter operations and market performance ("technical conference presentation"), which provides additional details on winter operations as well as longer-term infrastructure challenges. In our view, the region faces a precarious operating situation for the next several years, and we are likely to experience reliability threats and high gas and electricity prices until additional investments are made in appropriate energy infrastructure.

Thank you again for your attention to this critical issue and I hope the Committee will be in touch with any future requests for information.

Sincerely,

Gordon van Welie
President and Chief Executive Officer

[4] *Cold Weather Operations,* presented by ISO New England Vice President, System Operations, Peter Brandien at FERC's April 1 Technical conference on Winter 2013-2014 Operations and Market Performance in Regional Transmission Organizations and Independent System Operators (AD14-8-000) http://www.iso-ne.com/pubs/pubcomm/pres_spchs/2014/winter_operations_technical_conference_april_2014.pdf

1. For this past winter season, please address the following relating to the ISO-NE system:

a. Did ISO-NE have sufficient operating reserves during the recent cold weather conditions?

Prior to this winter, ISO New England (ISO-NE) improved the pricing of reliability commitments through the reserve markets. ISO-NE boosted its operating reserve requirement to price the hedge against uncertainty regarding generator performance, and sufficient operating reserves were maintained for the bulk of the winter season.

During the evening ramp on December 14, ISO-NE experienced shortages in Ten and Thirty Minute Reserves[5], due to demand running higher than forecast, interchange curtailments, and generator outages and reductions totaling approximately 400 MW. An Abnormal Conditions Alert was issued, and ISO-NE entered into several stages of Operating Procedure #4 (Actions During a Capacity Deficiency). As noted below, these actions included the dispatch of real-time Demand Response assets. The entire Shortage Event (as defined under our Forward Capacity Market Rules) lasted 85 minutes.

In addition, on January 28, ISO-NE experienced a 17-minute period of deficiency in the Thirty Minute Operating Reserves. During that period, additional generation was committed to meet system demand plus reserve requirements and the deficiency was quickly recovered.

It is noteworthy that ISO-NE experienced its 2013/2014 winter peak on December 17 (21,448 MW), but did not exceed the region's all-time winter peak, which occurred on January 15, 2004.

b. Were there generating units contracted for capacity that failed to produce power when called upon during the recent cold weather events? If yes, please describe the type of generation source for each contracted unit that failed to produce power.

e. Did ISO-NE experience any generation outages or curtailments due to lack of fuel? If yes, please describe the reason, scope, and duration of any lack of fuel.

f. Was ISO-NE required to adjust generation commitment and/or dispatch due to the conditions on the natural gas system?

As I noted in my introduction, declining resource performance continues to be a serious reliability concern in New England, and is not limited to one particular resource or fuel type. While the attached technical conference presentation provides greater detail, I will highlight several days in particular.

On January 7, nationwide demand for natural gas hit an all-time peak, and an emergency request was made from PJM Interconnection for 500 MW from ISO-NE. The chart below illustrates that during the afternoon ramp, 1,473 MW of natural gas-fired generation was unavailable due to an inability to make a timely guarantee of procurement of fuel. Although several resources later advised that they had procured natural gas, the resources were needed in a timely fashion to meet the emergency request and were therefore treated as unavailable. During the afternoon peak on January 7, natural gas and oil-fired units each comprised 25% of New England's generation mix with nuclear responsible for 23%.

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[5] http://www.iso-ne.com/sys_ops/op4_action_archiv/2013/implementation_of_iso_new_england_operatiing_procedure_4_on_saturday_december_14_2013.pdf

January 7 Hour Ending	Cumulative Capacity Reduction [MW]
12	284
13	848
14	1,473
15	1,473
16	1,473
17	1,189
18	1,189
19	1,189
20	1,189
21	1,212
22	1,280
23	1,280
24	1,280

On January 21, ISO-NE experienced a 2,061 MW reduction in capacity from the amounts cleared in the Day-Ahead Market to actual peak hour. This included reductions of 806 MW of oil-fired capacity and 576 MW from coal-fired units. Of the 508 MW of natural gas-fired capacity that was unavailable, 97 MW was for fuel-related reasons. We had similar challenges on January 27, with a loss of 2,085 MW of capacity. Of the 627 MW of natural-gas fired units that were unavailable, 42% of that total was due to lack of fuel. 1,297 MW of oil-fired resources were also unavailable at that time.

As the Committee knows well, in the last few years, New England has significantly increased its demand for natural gas for power generation, receiving 46% and 52% of our electricity from natural gas-fired power plants in 2013 and 2012, respectively. However, the lack of long-term, firm natural gas transportation contracts for power generation has left the region without a corresponding increase in gas pipeline infrastructure. During periods of high demand the last two winters, the region's gas pipeline capacity was challenged to meet the demand for both home heating and power generation. And prior to this winter, the region's oil-fired units were entering the critical winter season filling only a fraction of their overall storage capabilities, leading to quick depletion of oil inventory and making the Winter Reliability Program a necessity for winter 2013/2014.

This winter, the price of natural gas in New England rose substantially, averaging close to $25/MMBtu in January (a 133% increase over January 2013) with an average of $19.33/MMBtu for the winter season. Due to this sharp increase over prices in prior years, this winter ISO-NE dispatched a substantial number of oil-fired resources in economic merit. Gas prices exceeded oil prices on 57% of winter days (as compared to 18% the preceding winter) and as a result, oil units were in economic merit and base-loaded on several days. While oil resources were providing more energy than in recent years, natural gas was running at far below capacity.

As you would expect, the spike in natural gas prices (and reliance on oil-fired units) led to a significant increase in the price of wholesale electricity. Energy market costs this winter were $5.05 billion – just shy of the entire value of New England's energy markets in calendar year 2012. Sixty four percent of

average daily real-time prices were over $100 per megawatt hour, up from 28% in the winter 2012/2013.

It may interest the Committee to note that ISO-NE has submitted proposed changes to the region's Forward Capacity Market (FCM) with FERC that we believe will lead to improved resource performance. On January 17, ISO-NE submitted the "Pay for Performance[6]" proposal focused on more closely aligning revenue gained by generators through the FCM with actual performance during stressed system conditions. We believe these changes will send the proper market signals for generators to firm up their fuel supply and to make the appropriate capital and operational investments to ensure that their resources can perform when needed. I would be pleased to provide more information on the Pay for Performance proposal at the Committee's request.

c. At any time did ISO-NE rely on imports from other systems in order to meet its own system energy needs, outside of normal operating conditions? If yes, please describe the magnitude and duration of such reliance, and any remedial actions.

6. Please describe in detail how system conditions in neighboring Balancing Authorities affected ISO-NE's operations during recent cold weather conditions.

New England maintains 13 ties with neighboring regions: nine with New York, and two each with Hydro-Quebec and New Brunswick. Throughout the winter season, New England imported and exported electricity into and out of our region. In many instances, the amount that cleared the Day-Ahead Market flowing into New England was substantially lower than the amount that ultimately flowed into our region. This can be attributed to the prices in external areas being lower than New England in real-time and/or any expected reserve shortages in the external areas did not materialize in real-time, allowing more transactions to flow into New England across the ties.

d. Were there any periods of unplanned loss of load during this time? If yes, please describe the reason, scope, and duration of any unplanned loss of load.

New England's bulk electric system stayed in balance throughout the winter and did not experience any unplanned loss of load.

2. For the ISO-NE region this past winter season, what would have occurred in terms of reliability and affordability of electricity if coal-fired units, other fossil fuel-fired units, or nuclear power plants that have announced retirement had not been available?

a. How many of these retiring units ran during the recent cold weather incidents? How many megawatts did these retiring units provide?

New England has already experienced a significant number of generator retirements, with several more meaningful facilities preparing for shutdown in the coming months and years. Within the next five years, four power plants totaling nearly 10% of our total regional capacity will shut down:

- Salem Harbor Station (749 MW)
  - 4 units (coal & oil)

[6] http://iso-ne.com/regulatory/ferc/filings/2014/jan/er14-1050_000_1-17-14_pay_for_performace_part_1.pdf

- Vermont Yankee Station (604 MW)
  - 1 unit (nuclear)
- Norwalk Harbor Station (342 MW)
  - 3 units (oil)
- Brayton Point Station (1,535 MW)
  - 4 units (coal & oil)

By next winter, Vermont Yankee and the remaining Salem Harbor Station units (units 3 & 4) will be retired. From December 1, 2013-February 28, 2014, those two generators combined to provide over 1.5 million megawatt hours of electricity.

Based on our analysis, we estimate that up to 8,300 MW of non-gas-fired generation is "at risk" for retirement by 2020 (including 28 older oil and coal units). If all retire, ISO-NE estimates that 6,300 MW of new or repowered capacity will be needed in the region.

These retirements, coupled with an expanding demand for natural gas from New England businesses and residents, will put additional pressure on our already constrained natural gas pipeline system in New England and will likely increase the region's exposure to the uncertainty of the "just in time" nature of gas delivery for gas-fired generators.

b. Does ISO-NE plan to replace the capacity provided by the retiring units? If the replacement is expected to be natural gas units, is deliverability of natural gas an issue of concern in the ISO-NE footprint?

c. Has ISO-NE performed any economic modeling to determine how many natural gas units are likely to be built to replace retiring capacity?

d. Does ISO-NE expect or have any firm commitments that new natural gas units will be constructed within the ISO-NE footprint?

e. Is there sufficient natural gas transportation capability available in the ISO-NE footprint for anticipated new natural gas units?

ISO-NE is responsible for designing and administering the wholesale electricity markets. New and existing resources compete annually in the Forward Capacity Market to provide capacity three years in the future. Through the FCM, ISO-NE procures sufficient resources to meet the region's forecasted capacity needs. ISO-NE is also responsible for studying the potential interconnection of new generation resources into the bulk electric system. Potential projects are listed in ISO-NE's Interconnection Queue, which includes nearly 5,000 MW of proposed generation. Well over half (55%) of the megawatts in the queue are for proposed natural gas-fired generation with 40% of the overall amount represented by potential wind projects. We have undertaken numerous studies that I will note and we would be happy to discuss further with the Committee.

In 2012, ISO-NE finalized the first half of a two-part study[7] (undertaken by ICF International) of the natural gas system in New England. The study examined the availability of natural gas supplies during peak natural gas and electric demand periods by estimating pipeline capacity, LNG imports, and any potential peak demand reductions. Among its conclusions, the study noted that New England's natural gas supply infrastructure is not adequate to meet the region's winter power generation needs over the next decade without pipeline expansion. The second phase of the study, completed in 2013, includes

[7] http://www.iso-ne.com/committees/comm_wkgrps/prtcpnts_comm/pac/reports/2012/gas_study_public.pdf

two white papers on the impact of natural gas use in eastern New York on New England and examined potential savings from increased demand side management. Earlier this year, we commissioned ICF International to update their study to reflect the operational experiences observed this winter and to take into account the upcoming retirement of non gas-fired generation on the system. The results are sobering and confirm that, with the exception of some minor relief in the winter of 2016/17 (due to the addition of the Spectra AIM project during 2016), the gas pipeline system constraints are more severe than what was originally forecast in 2012.

ISO-NE has also participated in the several iterations of the Eastern Interconnection Planning Collaborative (EIPC), which included future scenarios of coal-fired generator retirements being replaced with gas-fired power plants. Most recently, ISO-NE continues our participation in the EIPC's ongoing gas-electric interface study[8], which includes six Participating Planning Authorities in the Northeast, Mid-Atlantic, and Midwest Regions.

In addition, the New England States Committee on Electricity (NESCOE) has undertaken a valuable study (with several updates) on the sufficiency of natural gas infrastructure in New England[9]. The initial study, released in December 2012, highlighted the ongoing capacity constraints and the likelihood of high natural gas and electricity prices in the region. NESCOE is updating its original study by examining the relative value of increasing the region's imports of hydro resources from Canada.

3. Please describe in detail how renewable energy resources performed when dispatched during the cold weather conditions.

5. Please describe in detail how distributed generation performed during the cold weather conditions

Renewable energy resources contributed energy at levels below the natural gas and oil resources mentioned above, but were still an important part of our energy mix. For instance, during the morning and afternoon peaks on January 7, wind and other renewable resources (including biomass) contributed about 6%-7% of electricity during those periods.

New England has seen a growth in wind generation in the last few years, growing from two megawatts in 2005 to over 700 MW today (with another 2,000 MW in the Interconnection Queue). In order to facilitate the reliable development of wind resources in the region and better understand the hurdles New England may face in bringing these variable resources to market, the region has undertaken several wind energy-related studies in the last few years. These include NESCOE's 2009 *New England Governors' Renewable Energy Blueprint*[10], the 2010 *New England Wind Integration Study*[11], and a 2011 economic study to examine the transmission constraints that may bottle up wind in various development areas[12]. In addition, ISO-NE is now publishing daily, week-long wind power forecasts that provide greater situational awareness and allow for more efficient use of the intermittent wind resources.

Distributed generation resources are a growing part of the region's portfolio. Through 2013, New England had approximately 178 MW of distributed generation (nameplate capacity), which we predict

[8] http://eipconline.com/Gas-Electric.html
[9] http://nescoe.com/Gas_Supply_Study.html
[10] http://www.nescoe.com/Blueprint.html
[11] http://www.iso-ne.com/committees/comm_wkgrps/prtcpnts_comm/pac/reports/2010/newis_report.pdf
[12] http://iso-ne.com/committees/comm_wkgrps/prtcpnts_comm/pac/reports/2014/2011_eco_study_final.pdf

will grow to over 630 MW in the next decade. In order to better understand the growth in photovoltaic solar and other DG resources in the coming years, ISO-NE is working with stakeholders to finalize the region's first long-term Distributed Generation Forecast[13].

4. Please describe in detail how demand response resources performed during the cold weather conditions. Was demand response subject to compliance penalties?

As part of ISO New England's Winter Reliability Program, 21 MW of Demand Response (DR) (not already participating in wholesale markets) was procured to help maintain Thirty-Minute Operating Reserves. As the chart below highlights, the Winter Reliability Program DR resources were used once each in December and January, and three times in February (the use of DR resources on December 14 was coincident with dispatching Real-Time DR resources as well). These resources, which were subject to forfeiture of payment under the Program if they failed to deliver adequately, performed well and were a valuable part of maintaining reliability during the winter season.

Interrupted	Restored
12/14/2013 17:00	12/14/2013 21:46
1/21/2014 17:25	1/21/2014 20:45
2/9/2014 18:07	2/9/2014 20:08
2/12/2014 7:10	2/12/2014 10:10
2/15/2014 17:36	2/15/2014 19:13

In total, 248 MW of real-time Demand Response assets were dispatched for a little over three hours on December 14, responding at 77% of expected performance (191 MW).

In addition, New England is particularly proud of the work it has done to create and annually update the nation's first multi-state energy efficiency forecast[14]. The New England region has invested approximately $2.3 billion in energy efficiency programs from 2009 to 2012 and we estimate $6.3 billion to be invested in similar programs from 2017 to 2023. Our forecast anticipates meaningful reductions in energy use throughout the region both in annual energy consumption and during peak periods.

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[13] Revised Interim PV Forecast (January 27, 2014): http://www.iso-ne.com/committees/comm_wkgrps/othr/distributed_generation_frcst/2014mtrls/jan272014/a_interim_pv_forecast_final_rev1.pdf

[14] ISO New England's Energy Efficiency Forecast Working Group: http://www.iso-ne.com/committees/comm_wkgrps/othr/enrgy_effncy_frcst/index.html